Section 5.1

Formulas you will need in this section:

Area of a sector:	Arc length:	Angular velocity:	Linear velocity:
$A=(1/2)r^2\theta$	$s = r\theta$	$\omega = \theta/t$	$v = s/t$ or $v = r\omega$

r = radius, θ = angle measure
For all formulas, θ must be in radians (including ω).

Angles

Initial side-
Terminal side-
Vertex-

Positive angle-
Negative angle-

Circles

Central angle-

Arc length-

Area of a sector-

Two units of angle measure are *degree* and *radian*.

A degree of a circle is $\dfrac{1}{360}$ of a revolution of the circle.

One radian is a length around the circle equal to the radius of the circle. In other words, suppose a central angle cuts an arc that is equal to the radius of the circle. Then that central angle has a radian measure of 1.

Let's take a look at a circle with a radius of 1 unit.

What is the radian measure of an angle equal to one complete revolution?

What is the radian measure for a straight angle (180°)?

What is the radian measure for an angle that is 1/4 of the circle (90°)

Conversions

Radians to degrees:

Example Convert 3 radians to degrees.

Degrees to radians:

Example Convert $\dfrac{120^{\circ}}{\pi}$ to radians.

Revolutions to radians:

Example How many radians are there in 3 revolutions?

Suppose you have a circle of radius r. And suppose a point is moving around that circle at a constant speed. We can look at two types of velocities:

1) How fast is the point moving about the circle (linear velocity)?
2) How fast is a central angle whose terminal side contains the point moving (angular velocity)?

Suppose we know how fast the angle is moving and we need to know the linear velocity:

Examples

1) A turntable with a radius of 10 feet is moving at a speed of 4 radians per minute. Find the linear speed (in feet per minute) of a point on the rim of the turntable.
2) Find a central angle (in radians) of a circle of radius 3 inches that subtends an arc of 6 inches.
3) Find the area of a sector of a circle with a central angle of 120° and radius 4 feet.
4) A windshield wiper is 30 inches long. How many inches will the tip of the wiper move during 1/6 of a revolution?
5) An object is traveling in a circular path of radius 6 feet. If the object sweeps out an angle of 4 radians in 20 seconds, what is the angular speed of the object in radians per second?
6) A clock with a 3 meter pendulum moves from side to side through an angle of 0.4 radians. How many meters does the pendulum move from side to side?
7) Find the radius (in feet) of a circle if a central angle of 85° subtends a 200 foot arc.
8) A record of radius 10 inches is spinning at 33 1/3 rpm. What is the linear speed, in in/min, of a point on the rim of the record?